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PATENT ABSTRACTS OF JAPAN

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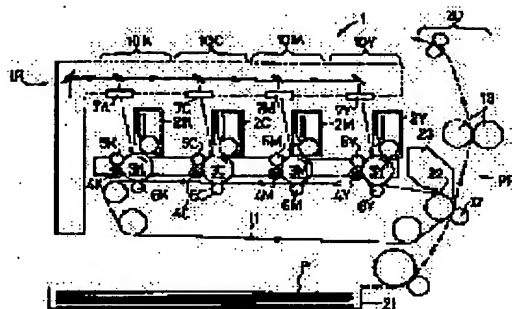
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(54) COLOR IMAGE FORMING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a color image forming device which can keep high image quality, attain a high printing speed, and be compacted, besides, which is excellent in environmental resistance.

SOLUTION: As to a tandem type copying machine 1, holding rollers 5(5Y, 5M, 5C, and 5K) temporarily holding residual toner remaining on photoreceptor drums 3(3Y, 3M, 3C, and 3K) after primary transfer are provided, the residual toner is discharged from the rollers 5 with a prescribed timing, and recovered inside a cleaner box 23 provided on an intermediate transfer belt 11. Thus, since respective image forming units 10(10Y, 10M, 10C, and 10K) can be constituted without cleaners while such image quality deterioration as roughness on a memory image and a dot image, and the color mixture of toner are prevented; the printing speed can be increased and the device can be compacted while keeping the high image quality. Besides, since contact electrifying brushes 4(4Y, 4M, 4C, and 4K), transfer rollers 6(6Y, 6M, 6C, and 6K), and 12 are used, environmental pollution caused by the zone production can be prevented.



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CLAIMS

[Claim(s)]

[Claim 1] In color picture formation equipment characterized by providing the following at least one of said the image formation units It is a cleaner loess image formation unit equipped with a development means of a jumping development method. It is color picture formation equipment which has a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object, and is characterized by said toner maintenance means discharging a residual toner currently held to predetermined timing. Image support Electrostatic latent-image means forming which forms an electrostatic latent image on said image support Two or more image formation units which have a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously An imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object

[Claim 2] It is color-picture formation equipment which said toner fulfills the conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$ in the color-picture formation equipment characterized by to provide the following, and is characterized by for said image-formation unit to have a toner maintenance means hold temporarily the residual toner which is a cleaner loess image-formation unit equipped with a development means of a contact development method, and remained on said image support after imprinting to said middle imprint object. Image support Electrostatic latent-image means forming which forms an electrostatic latent image on said image support Two or more image formation units which have a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously An imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object

[Claim 3] Color picture formation equipment characterized by performing image formation process control so that image formation processing may not be performed, when a residual toner discharged from said toner maintenance means exists in an exposure location and a development location on said image support in color picture formation equipment indicated to claim 1.

[Claim 4] Color picture formation equipment characterized by having a recovery means to collect from claim 1 residual toners discharged from said toner maintenance means in any one color picture formation equipment indicated by claim 3.

[Claim 5] It is color picture formation equipment characterized by being either of the cleaning means which said recovery means contacted said middle imprint object or said middle imprint object in color picture formation equipment indicated to claim 4, and were established.

[Claim 6] It is color picture formation equipment characterized by for said recovery means being a cleaning means contacted and formed in said middle imprint object in color picture formation equipment indicated to claim 4, and said cleaning means having a rotation cleaning means and a fixed cleaning means.

[Claim 7] Color picture formation equipment characterized by having an electric charge means to

re-electrify a residual toner discharged by the upstream of said cleaning means from said toner maintenance means in the polarity of normal in color picture formation equipment indicated to claim 5 or claim 6.

[Claim 8] Said electric charge means is color picture formation equipment characterized by being formed with the quality of the material which is in a positive side to a residual toner discharged [in / on color picture formation equipment indicated to claim 7, and / an electrification sequence] from said toner maintenance means.

[Claim 9] It is color picture formation equipment characterized by forming said electric charge means by conductive member in color picture formation equipment indicated to claim 7, and impressing the same polar voltage as the electrification polarity of normal.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the color picture formation equipment used for a copying machine, a printer, etc. of an electrophotography method. Furthermore, it is related with the color picture formation equipment which was excellent in them at pair environment nature while improvement in the speed and miniaturization of printing speed were attained by them, maintaining high definition in details by considering an image formation unit as a cleaner loess configuration.

[0002]

[Description of the Prior Art] As an example of conventional color picture formation equipment, there is a thing as shown in drawing 9. This image equipment 100 is the thing of the tandem type which carried out the parallel arrangement of yellow, a Magenta, cyanogen, and the four image formation units 101Y, 101M, 101C, and 101K for blacks continuously. Image formation unit 101Y for yellow centers on photo conductor drum 102Y. Electrification charger 103Y which electrifies the surface of photo conductor drum 102Y uniformly around it, Development counter 104Y which develops the electrostatic latent image formed on photo conductor drum 102Y, and is used as a toner image, It has cleaning box 106Y which collects and holds the residual toner which remained on photo conductor drum 102Y after imprint charger 105Y for imprinting a toner image on a record object, and the imprint of a toner image. Moreover, a Magenta, cyanogen, and the image formation units 101M, 101C, and 101K for blacks are also the things of the same configuration as this.

[0003] And the electrostatic latent image of a yellow component color is formed on photo conductor drum 102Y of image formation unit 101Y, and after this electrostatic latent image is developed by development counter 104Y and used as a toner image, that toner image is imprinted by the record object by imprint charger 105Y. Subsequently, the electrostatic latent image of a Magenta component color is formed on photo conductor drum 102M of image formation unit 101M, and after this electrostatic latent image is developed by development counter 104M and used as a toner image, that toner image is imprinted by the record object in laminating by imprint charger 105M. After repeating the same process in the image formation units 101C and 101K successively below, a toner is fixed to a record object and it is [a necessary color picture is copied and] made to be recorded by the fixing roller 107.

[0004] Moreover, there are some in which the miniaturization of drawing is by simplifying the cleaning box of some image formation units, and considering as a cleaner loess configuration like the color picture formation equipment indicated by JP,5-53414,A.

[0005]

[Problem(s) to be Solved by the Invention] However, there was a problem that miniaturization of equipment was difficult, with the above-mentioned conventional color picture formation equipment 100. It has the cleaning boxes 106Y, 106M, 106C, and 106K in every image formation unit 101Y, 101M, and 101C of each color, and 101K, and is because the occupancy capacity of each image formation units 101Y, 101M, 101C, and 101K is large.

[0006] On the other hand, in color picture formation equipment 200 given in JP,5-53414,A,

although miniaturization of equipment is attained, it cannot be said that it is enough. It is because it still has the cleaner box to some image formation units. Moreover, non-contact electrification chargers (corona discharge machine etc.) were needed for the image formation unit of cleaner loess, and there was also a problem about the environmental pollution by generating of ozone in it.

[0007] Then, it is made in order that this invention may solve the above-mentioned trouble, and improvement in the speed and miniaturization of printing speed can be attained, maintaining high definition, and let it be a technical problem to offer the color picture formation equipment which was further excellent in pair environment nature.

[0008]

[Means for Solving the Problem] According to invention of claim 1, in order to solve the above-mentioned trouble [Image support, Two or more image formation units which have electrostatic latent-image means forming which forms an electrostatic latent image on said image support, and a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously, In color picture formation equipment which has an imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object At least one of said the image formation units is a cleaner loess image formation unit equipped with a development means of a jumping development method. It has a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object, and said toner maintenance means is characterized by discharging a residual toner currently held to predetermined timing.

[0009] In invention of claim 1, an electrostatic latent image is formed on image support of electrostatic latent-image means forming, and this electrostatic latent image is developed by development means, and let it be a toner image. And the 1st order of this toner image is imprinted by middle imprint object. Subsequently, after a toner image is formed also in other image formation units, the toner image is imprinted in piles on a middle imprint object in laminating. A toner image is formed on a middle imprint object by repeating same process successively below. Then, the secondary toner image formed in a middle imprint object is imprinted by record object with an imprint means, and it is established, and a necessary color picture is copied and recorded. Here, in each image formation unit, a toner which was not imprinted by middle imprint object remains on image support after the primary toner image was imprinted by middle imprint object. This residual toner is recovered by toner maintenance means before next image formation is performed. And a residual toner collected by toner maintenance means is discharged to predetermined timing. As predetermined timing, in order to maintain high definition, it is good to consider as the time of non-image formation. Moreover, when toner empty, image quality deterioration, etc. are detected, you may make it discharge a residual toner from a toner maintenance means by user input.

[0010] Thus, by having collected residual toners which remain on image support after a primary imprint, and having established a toner maintenance means to discharge the residual toner to predetermined timing Since processing with a residual toner suitable also as a configuration of cleaner loess is performed A residual toner after discharge does not exist in an exposure location and a development location on image support at the time of image formation, color mixture of image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. and a toner is prevented, and high definition is maintained. Since each image formation unit furthermore serves as a configuration of cleaner loess and the occupancy capacity becomes small, improvement in the speed and miniaturization of printing speed are attained by installing these continuously. In addition, a jumping development method is the non-contact development method of making a toner flying and developing it, by impressing AC bias which superimposed alternation voltage on direct current voltage.

[0011] Electrostatic latent-image means forming which forms an electrostatic latent image on image support and said image support according to invention of claim 2, Two or more image formation units which have a development means to give a toner to said electrostatic latent

image and to form a toner image, and were installed continuously, In color picture formation equipment which has an imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object Said toner fulfills conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$. Said image formation unit It is a cleaner loess image formation unit equipped with a development means of a contact development method, and is characterized by having a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object.

[0012] Invention of claim 2 is also developed by development means by forming an electrostatic latent image on image support of electrostatic latent-image means forming, and let this electrostatic latent image be a toner image. Then, the primary toner image is imprinted by middle imprint object. Subsequently, after a toner image is formed also in other image formation units, the toner image is imprinted in piles by middle imprint object in laminating. A toner image is formed on a middle imprint object by repeating same process successively below. Then, the secondary toner image formed in a middle imprint object is imprinted by record object with an imprint means, and it is established, and a necessary color picture is copied and recorded. Here, in each image formation unit, a toner which was not imprinted by the primary middle imprint object remains on image support after the primary toner image was imprinted by middle imprint object. This residual toner is recovered by toner maintenance means before next image formation is performed. Thus, since processing with a residual toner suitable also as a configuration of cleaner loess is performed by having established a toner maintenance means collected residual toners which remain on image support after a primary imprint, the residual toner after discharge does not exist in an exposure location and a development location on image support at the time of image formation, the color mixture of image-quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. and a toner is prevented, and high definition is maintained. Since each image formation unit furthermore serves as a configuration of cleaner loess and the occupancy capacity becomes small, improvement in the speed and miniaturization of printing speed are attained by installing these continuously.

[0013] Here, since it has a development means of a contact development method in invention of claim 2, if a residual toner is discharged from a toner maintenance means, in order not to pass through a development location, there is a possibility that it may have a bad influence on development and image quality may deteriorate. Therefore, as a toner used for development, what fulfills conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$ (henceforth a "globular form toner") is used. A shape factor expresses a ratio of a boundary length of a projection image to a boundary length of a considerable circle of a projection image of a toner, and the sphericity becomes low as a perfect spherical next door and a shape factor become small from "1", when a shape factor is "1." And about 100% of imprint effectiveness is securable by using a globular form toner.

Thereby, since a toner which remains on image support after a primary imprint serves as a slight amount, if it is till development means exchange, it can collect and hold a residual toner with a toner maintenance means. Therefore, an image formation unit can be considered as a cleaner loess configuration. In addition, a residual toner held at a toner maintenance means is discharged and processed at the time of exchange of a development means.

[0014] According to invention of claim 3, in color picture formation equipment indicated to claim 1, when a residual toner discharged from said toner maintenance means exists in an exposure location and a development location on said image support, it is characterized by performing image formation process control so that image formation processing may not be performed.

[0015] In invention of claim 3, when a residual toner discharged from a toner maintenance means exists in an exposure location and a development location, image formation processing is not performed. Such control is performed by electrostatic latent-image means forming and control means of development bias. According to discharge timing of a residual toner, exposure timing is controlled by electrostatic latent-image means forming, development bias which changes alternation superposition voltage of development bias to direct current voltage etc. by control means of development bias is changed to a float condition, or, specifically, control of making an alternation voltage component small to voltage on which a toner does not fly is performed. Since

a residual toner discharged from a toner maintenance means does not exist in an exposure location on image support by these, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is prevented. Moreover, since it passes certainly and a residual toner discharged from a toner maintenance means is processed, without a development means collecting development locations on image support, color mixture of a toner is prevented. [0016] Furthermore, in case it shifts to processing at the time of image formation from the time of non-image formation, it is desirable beforehand to control previously, so that discharge and recovery of a residual toner in a toner maintenance means are changed and a residual toner does not come to an exposure location and a development location at the time of image formation by time amount to which a point of arbitration on image support passes through between a toner maintenance means and development locations.

[0017] According to invention of claim 4, it is characterized by having a recovery means to collect from claim 1 residual toners discharged from said toner maintenance means in any one color picture formation equipment indicated by claim 3. Moreover, according to invention of claim 5, in color picture formation equipment indicated to claim 4, said recovery means is characterized by being either of the cleaning means contacted and formed in said middle imprint object or said middle imprint object.

[0018] A residual toner which was discharged from a toner maintenance means and was again supported with invention of claim 4 or claim 5 on image support is recovered by recovery means. It seems that namely, a residual toner does not have a bad influence on image formation, and the inside of equipment is not dispersed. Thereby, high definition is secured. In addition, although a cleaning means contacted and formed in a middle imprint object or said middle imprint object as a recovery means is used, it is also possible to collect with record objects (copy paper etc.) depending on the case.

[0019] According to invention of claim 6, in color picture formation equipment indicated to a claim, said recovery means is a cleaning means contacted and formed in said middle imprint object, and said cleaning means is characterized by having a rotation cleaning means and a fixed cleaning means.

[0020] In invention of claim 6, a residual toner discharged from a toner maintenance means is recovered by a rotation cleaning means and fixed cleaning means. Thereby, since residual toners are collected certainly, high definition is secured. Depending on the case, only one of a rotation cleaning means and the fixed cleaning means may be used. However, since it is difficult for a fixed cleaning means to recover when using a globular form toner, concomitant use with a rotation cleaning means and a fixed cleaning means is desirable, using a rotation cleaning means.

[0021] According to claim 7, in color picture formation equipment indicated to claim 5 or claim 6, it is characterized by having an electric charge means to re-electrify a residual toner discharged by the upstream of said cleaning means from said toner maintenance means in the polarity of normal. Moreover, according to invention of claim 8, in color picture formation equipment indicated to claim 7, said electric charge means is characterized by being formed with the quality of the material which is in a positive side to a residual toner discharged from said toner maintenance means in an electrification sequence. Furthermore, according to invention of claim 9, in color picture formation equipment indicated to claim 7, said electric charge means is characterized by being formed by conductive member and impressing the same polar voltage as the electrification polarity of normal.

[0022] With these color picture formation equipments, a residual toner discharged from a toner maintenance means is electrified by the electrification polarity of normal with an electric charge means. And the residual toner is recovered by cleaning means. Since it is carried out mechanically [recovery by cleaning means at this time], and electrically and a residual toner is certainly recoverable, high definition is secured. In addition, or it uses what was formed with the quality of the material which is in a positive side to a residual toner as an electric charge means in an electrification sequence, impressing the electrification polarity of normal and the same polar voltage to it using a conductive member etc. is mentioned.

[0023]

[Embodiment of the Invention] Hereafter, the gestalt of the operation which materialized the

color picture formation equipment of this invention is explained to details based on a drawing. The gestalt of this operation is the digital color copying machine (only henceforth a "copying machine") which applied the color picture formation equipment of this invention.

[0024] First, the gestalt of operation is explained to the 1st. The copying machine 1 concerning the gestalt of the 1st operation consists of the print sections PR which print the image reader section IR which roughly divides and reads a manuscript image, and the read image in the record paper, and are reproduced, as shown in drawing 1. The image reader section IR reads the optical information acquired by separating the color of a manuscript image into the three primary colors of red (R), green (G), and blue (B) by the CCD sensor, and performs data processing to the image data. Moreover, the conveyance section 20 in which the printer section PR conveys the recording paper P and yellow which is a reappearance color at the recording paper P (Y), A Magenta (M), cyanogen (C), black (K) (a color sign "Y, M, C, K" is hereafter added to the number of the portion relevant to yellow, a Magenta, cyanogen, and each reappearance color of black suitably.) It comes to have four image formation units 10Y, 10M, 10C, and 10K and the middle imprint belt 11 for forming the image of four colors, respectively.

[0025] The conveyance section 20 has the medium tray 21 which holds the recording paper P, the secondary imprint roller 12 which was formed on the middle imprint belt 11 and which piles up and imprints the secondary imprint toner image on the recording paper P, a fixing roller 13, two or more conveyance rollers to which the toner image imprinted by the secondary recording paper P is fixed, etc., sends out the recording paper P to predetermined timing, and conveys it with constant speed.

[0026] The image formation units 10Y, 10M, 10C, and 10K form an image, and the photo conductor drums 3Y, 3M, 3C, and 3K by which the parallel arrangement was carried out continuously consist of electrostatography methods as a center. and around the photo conductor drums 3Y, 3M, 3C, and 3K The electrification brushes 4Y, 4M, 4C, and 4K which electrify uniformly the surface of the photo conductor drums 3Y, 3M, 3C, and 3K, The photo conductor drums 3Y, 3M, and 3C and the laser arm heads 7Y, 7M, 7C, and 7K which form a necessary electrostatic latent image according to image information on 3K, The maintenance rollers 5Y, 5M, and 5C and 5K grade which hold temporarily the development counters 2Y, 2M, 2C, and 2K which a toner is made to fly to an electrostatic latent image, and are developed, and the toner which remained after development to the photo conductor drums 3Y, 3M, 3C, and 3K are arranged. That is, a copying machine 1 is the thing of the tandem type which carried out the parallel arrangement of the four cleaner loess image formation units continuously, and improvement in the speed of a print speed and miniaturization of equipment are attained.

[0027] Moreover, directly under each photo conductor drums 3Y, 3M, 3C, and 3K, the primary imprint rollers 6Y, 6M, 6C, and 6K which imprint the photo conductor drums 3Y, 3M, and 3C and the primary toner image which it developed on 3K are arranged to the middle imprint belt 11. The middle imprint belt 11 is a belt of the shape of endless [which has the surface resistivity of 106-108ohms / ** degree]. Furthermore, between the secondary imprint roller 13 and primary imprint roller 6Y, the cleaner box 23 equipped with the cleaning blade 22 which carries out removal recovery of the toner which remained on the middle imprint belt 11 after the residual toner discharged from the maintenance roller 5 and the secondary imprint is arranged.

[0028] Then, actuation of the copying machine 1 constituted as mentioned above is explained. First, in the control section of a copying machine 1, image data processing, such as a shading compensation, and concentration conversion, edge enhancement, is performed based on the level of the red (R) and green (G) which were obtained in the image reader section IR, and the optical information on the image for every blue (B) color component on the strength. And it changes into the write-in image data of yellow (Y), a Magenta (M), cyanogen (C), and each reappearance color of black (K), and the image data of these yellow (Y), a Magenta (M), cyanogen (C), and black (K) is once stored in said control section.

[0029] Then, based on the image data stored in said control section, modulation luminescence of the laser beam corresponding to each reappearance color is carried out in the laser arm heads 7Y, 7M, 7C, and 7K. On the other hand, after the photo conductor drums 3Y, 3M, 3C, and 3K are rotating in the direction of an arrow head in drawing 1 and are uniformly charged in the surface

with the electrification brushes 4Y, 4M, 4C, and 4K, the exposure scan of them is carried out by said laser beam. The electrostatic latent image corresponding to each photo conductor drums 3Y, 3M, and 3C and each reappearance color formed on 3K is developed by this exposure, respectively with the development counters 2Y, 2M, 2C, and 2K having the toner of each reappearance color, and is used as the toner image of each color. And in each opposite section of the photo conductor drums 3Y, 3M, 3C, and 3K and the middle imprint belt 11, the heavy imprint of these toner images is carried out one by one on the middle imprint belt 11 with the primary imprint rollers 6Y, 6M, 6C, and 6K. Then, the toner image piled up and imprinted on the middle imprint belt 11 is conveyed to the opposite section with the secondary imprint roller 12. And the secondary toner image on the middle imprint belt 11 is imprinted with the secondary imprint roller 12 by the recording paper P to which paper was fed from the medium tray 21. Then, the recording paper P with which the toner image was imprinted is conveyed by the fixing roller 13, and it is fixed to it on the recording paper P while being heated here, and the toner image of each color fusing and being made a full color image.

[0030] On the other hand, the residual toner which remained to the photo conductor drums 3Y, 3M, 3C, and 3K after primary imprinting to the middle imprint belt 11 on the maintenance rollers 5Y, 5M, 5C, and 5K. Moreover, the toners which remained on the middle imprint belt 11 after secondary imprinting to the residual toner and the recording paper P which were discharged from the maintenance rollers 5Y, 5M, 5C, and 5K are collected in the cleaner box 23.

[0031] Here, processing of the residual toner of photo conductor drum lifting in the image formation unit formed into cleaner loess is explained more to details using drawing 2. In addition, since each image formation units of all are the same configurations, they omit and explain a color sign.

[0032] First, -1200V are impressed to the electrification brush 4, and the surface of the photo conductor drum 3 is electrified in abbreviation -700V. Under the present circumstances, since the residual toner which remained on the photo conductor drum 3 after the primary imprint is also electrified by coincidence at negative polarity, all residual toners are collected by the maintenance roller 5 by impressing about [-300V] voltage to the maintenance roller 5. For this reason, in the exposure location on the photo conductor drum 3, since a toner does not exist at all, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is not generated. Thus, as for the formed electrostatic latent image, development is performed by the development counter 2. To namely, developing-roller 2a by which the development gap was set more widely than a toner layer as 200 micrometers. The development bias which superimposed amplitude 1500V and an alternating current component with a frequency of 2kHz on direct-current-voltage -300V is impressed. The toner layer formed in developing-roller 2a by this flies in a development field, and is given to an electrostatic latent image, the electrostatic latent image formed on the photo conductor drum 3 is developed, and a toner image is formed.

[0033] The amount of toners with which the development on the photo conductor drum 3 at this time is presented is 0.9 mg/cm². Concentration sufficient with a degree is securable. Moreover, high imprint effectiveness can be acquired by impressing suitable imprint voltage to the middle imprint belt 11. Therefore, with the gestalt of this operation, -500V were impressed to the primary imprint roller 6 as imprint voltage. Thus, the 1st order is imprinted to the middle imprint belt 11 because there is no effect of the recording paper P and high imprint effectiveness can be held, since a toner image is not imprinted on the direct recording paper P. And by securing high imprint effectiveness, the amount of the residual toner which remains on the photo conductor drum 3 after a primary imprint can be lessened. Even if this does not prepare the cleaner box which collects residual toners for every image formation unit, it becomes possible to collect residual toners only with the maintenance roller 5.

[0034] The case where a whole surface solid image is imprinted is considered using the printing length of the **** direction as 40cm in A3 size here. In addition, the imprint effectiveness in the gestalt of this operation is 90%. The amount of the toner with which the amount of the toner with which development is presented as described above is actually used for development since 0.9 mg/cm² and imprint effectiveness are 90% serves as 32.4 mg/cm. Therefore, the amount of the residual toner which remains on the photo conductor drum 3 serves as 3.6 mg/cm. And the

amount of toners which the maintenance roller 5 should collect since the outer diameter of the maintenance roller 5 is set to $\phi 16\text{mm}$ with the gestalt of this operation is 0.72 mg/cm^2 . It becomes, and since the layer of a residual toner is below two-layer, it can be enough supported with the maintenance roller 5.

[0035] And although it is necessary to discharge and process the residual toner collected on the maintenance roller 5 at the time of non-image formation, in case a toner image is piled up by the imprint with the primary imprint roller 6, in order that the collected residual toner may contact the toner image of other color components, color mixture of it is carried out also to some. For this reason, it cannot return to a development counter like the cleaner loess image formation equipment of monochrome. Then, before the residual toner discharged from the maintenance roller 5 arrives at a development location, the alternating current component of development bias is turned off and it is supposed that development bias control of changing only to a dc component is performed. Without the residual toners discharged from the maintenance roller 5 being collected by the development counter 2 by this, it will pass through a development location and the color mixture of a toner is prevented.

[0036] The development bias control at this time is explained using the timing chart of drawing 3. Time of day T1 It is in the condition of image formation processing, and the exposure scan by the laser arm head 7 is performed, an electrostatic latent image is formed, with the development counter 2, alternating voltage V1 is before impressed as development bias, and development is performed. Moreover, voltage V3 is impressed to the maintenance roller 5, and the residual toners after a primary imprint are collected.

[0037] And time of day T1 It sets, the applied voltage to the maintenance roller 5 is changed to voltage V4, and discharge of a residual toner is started. moreover, time of day T1 from — time amount t1 Time of day T2 after progress It sets and the exposure scan by the laser arm head 7 is completed. Here, time amount t1 is time amount taken for the location of the arbitration on the photo conductor drum 3 to move from an opposite location with the maintenance roller 5 to an exposure location. Namely, time of day T2 It sets, and just before the residual toner discharged on the photo conductor drum 3 from the maintenance roller 5 arrives at an exposure location, the exposure scan by the laser arm head 7 is completed. Thereby, the residual toner discharged from the maintenance roller 5 by the exposure location on the photo conductor drum 3 does not exist at the time of the exposure scan by the laser arm head 7, and image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is prevented at it.

[0038] furthermore, time of day T1 from — time amount t2 Time-of-day T3 after progress It sets and development bias is changed from alternating voltage V1 to direct current voltage V2. Here, it is time amount t2. It is the time amount taken for the location of the arbitration on the photo conductor drum 3 to move from an opposite location with the maintenance roller 5 to a development location. Namely, time-of-day T3 It sets, and just before the residual toner discharged on the photo conductor drum 3 from the maintenance roller 5 arrives at a development location, development bias changes from alternating voltage V1 to direct current voltage V2. Since it passes through a development location certainly, without the residual toners discharged from the maintenance roller 5 being collected by the development counter 2 by this, the color mixture of a toner is prevented.

[0039] Thus, the residual toner discharged from the maintenance roller 5 which passed the development location is charged in negative polarity. Since -500V are impressed to one of these, and the primary imprint roller 6, a residual toner is imprinted by the middle imprint belt 11, is removed by the cleaning blade 22 after that, and is held in the cleaning box 23.

[0040] Then, time-of-day T four It sets, and the voltage impressed to the maintenance roller 5 changes to voltage V3 again, ends discharge of a residual toner, and starts recovery. moreover, time-of-day T four from — time amount t1 Time of day T5 after progress It sets and the exposure scan by the laser arm head 7 is performed. further — time of day T5 from — time amount t2 Time of day T6 after progress It sets, development bias is changed from direct current voltage V2 to alternating voltage V1, and image formation processing is performed again. And repeat activation of the above-mentioned residual toner processing is carried out, and a residual toner is processed appropriately. Since it becomes unnecessary to prepare the cleaning

box for collecting residual toners for every image formation unit by this, cleaner loess-ization can be attained.

[0041] As mentioned above, according to the copying machine 1 applied to the gestalt of this operation as explained to details The maintenance roller 5 which holds temporarily the residual toner which remained on the photo conductor drum 3 after the primary imprint is formed. By discharging the residual toner from the maintenance roller 5 to predetermined timing, and having made it collect in the cleaner box 23 prepared on the middle imprint belt 11 Since each image formation unit 10 can be considered as a cleaner loess configuration and occupancy capacity becomes small, maintaining high definition, miniaturization of equipment is attained. Moreover, since a copying machine 1 is a tandem type, improvement in the speed of printing speed is also attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0042] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, although the thing of a jumping development method is used with the gestalt of implementation of the above 1st as development counters 2Y, 2M, 2C, and 2K, since color mixture is not carried out to other color components about the yellow component of which a primary imprint is performed at the very first to the middle imprint belt 11, considering as a contact development method is also possible. Moreover, the maintenance roller 5 may be arranged to whichever of the upstream and the downstream to the electrification brush 4, and even if it touches the electrification brush 4 further, it may be unified. It is also possible to use a film, a blade, a roller, etc. and to use a fiber brush, a magnetic brush, a film, a blade, etc. instead of the maintenance roller 5 instead of the electrification brush 4 further again. In addition, location sequence, an applied-voltage value, etc. of each image form unit are mere instantiation, and it cannot be overemphasized that it is not restricted to these.

[0043] Next, the gestalt of the 2nd operation is explained. Although the copying machine 1 and fundamental structure concerning the gestalt of the 1st operation are made the same as the copying machine 30 concerning the gestalt of the 2nd operation is shown in drawing 4, the configurations of a development counter 32 and the cleaning box 33 differ for a while. That is, the cleaning box 33 is equipped with the rotation brush 34 using the thing of the contact development method which holds a nonmagnetic 1 component globular form toner (mean particle diameter of 8 micrometers) as a development counter. In addition, a same sign is attached about the same thing as what was illustrated as a gestalt of the 1st operation, and the explanation is omitted.

[0044] Processing of the residual toner on the photo conductor drum 3 in the image formation unit by which such a copying machine 30 was formed into cleaner loess is explained to details using drawing 5. In addition, since each image formation units of all are the same configurations, they are explained, using image formation unit 3Y of yellow (Y) as a representative.

[0045] First, -1200V are impressed to electrification brush 4Y, and the surface of photo conductor drum 3Y is electrified in abbreviation-700V. Under the present circumstances, since the residual toner after a primary imprint is also electrified by coincidence at negative polarity, all residual toners are collected by maintenance roller 5Y by impressing the about [-300V] voltage V3 to maintenance roller 5Y. For this reason, in the exposure location on photo conductor drum 3Y, since a toner does not exist at all, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is not generated. Thus, as for the formed electrostatic latent image, development is performed by development counter 2Y. That is, the development bias Vb is impressed to development counter 2Y, and the toner layer formed on the development sleeve 35 by this is given in a development field to an electrostatic latent image. The electrostatic latent image formed on photo conductor drum 3Y is developed by this, and a toner image is formed.

[0046] The amount of toners with which the development on photo conductor drum 3Y at this time is presented is 0.9 mg/cm². Concentration sufficient with a degree is securable. Moreover, high imprint effectiveness can be acquired by impressing suitable imprint voltage to the middle

imprint belt 11. Therefore, with the gestalt of this operation, -500V were impressed to primary imprint roller 6Y as imprint voltage. And by securing high imprint effectiveness, it becomes possible to lessen the amount of the residual toner which remains on photo conductor drum 3Y after a primary imprint.

[0047] However, since the development sleeve 35 touches photo conductor drum 3Y in development counter 32Y, the residual toners discharged from maintenance roller 5Y will be collected by development counter 3Y. For this reason, although the problem of color mixture is not produced in the image formation unit of the yellow which performs a primary imprint at the very first at the middle imprint belt 11, in the Magenta (M) arranged at the degree of yellow (Y), cyanogen (C), and each image formation unit of black (K), color mixture with other colors poses a problem.

[0048] Then, he makes imprint effectiveness into about 100%, and is trying for a toner to hardly remain on photo conductor drum 3Y after a primary imprint by using a globular form toner in the gestalt of this operation. For this reason, it becomes possible to collect residual toners in maintenance roller 5Y, and to hold to the life cycle of development counter 3Y. And the residual toner collected by maintenance roller 5Y is discharged from the maintenance roller 5 at the time of exchange of development counter 2Y, and are collected in the cleaning box 33 equipped with the rotation brush 34 through the middle imprint belt 11. It is because the globular form toner is used, so it is difficult to remove the residual toner on the middle imprint belt 11 with a blade. Moreover, in order to raise removal effectiveness, the dc component is impressing the voltage which superimposed amplitude 100V and the frequency of 2kHz as an alternating current component at the voltage which is -500V to a rotation brush. Thereby, the residual toner on the middle imprint belt 11 is removed certainly, and is held in the cleaning box 33.

[0049] As described above, since conglomeration of a toner was required, with the gestalt of this operation, it investigated about the image quality deterioration by the toner configuration. The result is shown in a table 1.

[0050]

[A table 1]

形状計数 S F	画像品質
0.94	×
0.95	×~△
0.96	○
0.985	○
0.995	○

[0051] Image quality deterioration becomes remarkable as a shape factor SF becomes small so that clearly from a table 1. And with [a shape factor SF] "0.96", high definition can be secured, without image quality deterioration arising. [more than] Therefore, a shape factor SF is the toner which fulfills the conditions of " $0.96 \leq SF \leq 1.0$ ", and the more desirable one with it of the ability to be used as a globular form toner is good. [near / a shape factor SF is infinite and / "1.0"]

[0052] As mentioned above, according to the copying machine 30 applied to the gestalt of the 2nd operation as explained to details, about 100% of imprint effectiveness is acquired by having held the globular form toner in the development counter 2 of a contact development method. Thereby, it becomes possible [the residual toner which remains on the photo conductor drum 3 after a primary imprint] for the maintenance roller 5 to recover this residual toner, and to hold to the life cycle of a development counter 3, since it becomes a minute amount, and the color mixture of a toner is also prevented. Therefore, since each image formation unit can be considered as a cleaner loess configuration and the occupancy capacity becomes small,

maintaining high definition, miniaturization of equipment is attained. Moreover, since a copying machine 1 is a tandem type, improvement in the speed of printing speed is also attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0053] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, with the gestalt of implementation of the above 2nd, the arrangement location of the electrification brush 4 and the maintenance roller 5 may be made into reverse. It is because there are few possibilities that the electrification polarity of the residual toner on photo conductor drum 3Y will turn into reversed polarity since the middle imprint belt 11 is minded and primary imprint voltage can be stopped low, so there is almost no possibility that the recovery capacity of the maintenance roller 5 may decline. Moreover, although the maintenance roller 5 is used as a maintenance means of a residual toner, it is possible by impressing alternating voltage to the electrification brush 4, without forming the maintenance roller 5 to also make electrification of the photo conductor drum 3 and recovery of a residual toner make it serve a double purpose. In addition, location sequence, an applied-voltage value, etc. of each image form unit are mere instantiation, and it cannot be overemphasized that it is not restricted to these.

[0054] The gestalt of the 3rd operation is explained to the last. The copying machine concerning the gestalt of the 3rd operation makes the same the copying machine 1 and fundamental structure concerning the gestalt of the 2nd operation, and only the configurations of a cleaning box differ. That is, as shown in drawing 6, the cleaning box 43 is equipped with the cleaning rotation brush 44 and a cleaning blade 42.

[0055] In each opposite section of the photo conductor drum 3 and the middle imprint belt 11, the heavy imprint of the toner image formed on the photo conductor drum 3 with this copying machine as well as the gestalt of the 2nd operation is carried out one by one on the middle imprint belt 11 with the primary imprint roller 6. Then, the toner image piled up and imprinted on the middle imprint belt 11 is conveyed to the opposite section with the secondary imprint roller 12. And the secondary toner image on the middle imprint belt 11 is imprinted with the secondary imprint roller 12 by the recording paper P to which paper was fed from the medium tray 21. Then, the recording paper P with which the toner image was imprinted is conveyed by the fixing roller 13, and it is fixed to it on the recording paper P while being heated here, and the toner image of each color fusing and being made a full color image.

[0056] the residual toner which remained on the photo conductor drum 3 on the other hand after primary imprinting to the middle imprint belt 11 — the maintenance roller 5 — moreover, the toners which remained on the middle imprint belt 11 after secondary imprinting to the residual toner and the recording paper P which were discharged from the maintenance roller 5 are collected in the cleaner box 43.

[0057] Here, if the imprint effectiveness at the time of imprinting the secondary toner image piled up and imprinted on the middle imprint belt 11 on the recording paper P becomes remarkably low, it will become the cause which causes image quality deterioration only with a rotation cleaning means or a fixed cleaning means chisel, without the ability fully cleaning. For example, when resistance change of the secondary imprint roller 12 and the middle imprint belt 11 is large, and a record object is very coarse, secondary imprint effectiveness falls. So, in the copying machine concerning the gestalt of this operation, the cleaning box 43 equipped with the cleaning rotation brush 44 and a cleaning blade 42 is formed.

[0058] And the most is first removed mechanically by the cleaning blade 42, and the toners which remained on the middle imprint belt 11 are collected. Moreover, paper powder, a foreign matter, etc. are removed by the cleaning blade 42. Under the present circumstances, the toner which was not able to be removed by the cleaning blade 42 is removed mechanically and electrically by the cleaning rotation brush 44 with which the voltage which superimposed amplitude 100V and the frequency of 2kHz on the voltage whose dc component is -500V as an alternating current component is impressed, and are collected. Thereby, the toner which remained on the middle imprint belt 11 is removed certainly, and are collected in cleaning

BOKKU 43. Therefore, even when secondary imprint effectiveness falls and many toners remain on the middle imprint belt 11, the toner is removed certainly and image quality deterioration is prevented.

[0059] As mentioned above, according to the copying machine applied to the gestalt of the 3rd operation as explained to details, the toner which remained on the middle imprint belt 11 after the secondary imprint is removed certainly, and are collected. Thereby, image quality deterioration is prevented and high definition is maintained. Moreover, since the parallel arrangement (tandem type) of each image formation unit is carried out with the cleaner loess configuration, miniaturization and improvement in the speed of printing speed are attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0060] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, since the toner which remained to the middle imprint belt 11 has the electrification property of amphipathy, it is impressing the voltage which superimposed the alternating current component to the cleaning rotation brush 44 with the gestalt of this operation, but even if it does not superimpose an alternating current component, the same removal effect can be acquired by considering as the configuration shown below.

[0061] That is, the 1st configuration provides the nylon sheet 52 which electrifies the electrification polarity of the toner which remained on the middle imprint belt 11 after the secondary imprint to the upstream of the cleaning rotation brush 44 in the polarity (it becomes negative polarity in the gestalt of this operation) of normal, as shown in drawing 7. Moreover, direct-current-voltage +500V are impressed to the cleaning rotation brush 44. Therefore, since the toner which remained on the middle imprint belt 11 after the secondary imprint is electrified by the negative polarity which is the electrification polarity of normal altogether in case it passes the nylon sheet 52, they are certainly collected by the cleaning rotation brush 44. In addition, it is [that what is necessary is just what what is arranged to the upstream of the cleaning rotation brush 44 is not restricted / what / to a nylon sheet, but electrifies a toner in the polarity of normal like silicone rubber] possible not only a sheet but to constitute from a roller, a blade, etc.

[0062] Moreover, the 2nd configuration provides the conductive liner sheet 62 in the upstream of the cleaning rotation brush 44, as shown in drawing 8. And direct-current-voltage-1000V are impressed to a conductive liner sheet 62, and direct-current-voltage +500V are impressed to the cleaning rotation brush 44. Therefore, since the toner which remained on the middle imprint belt 11 after the secondary imprint is electrified by the negative polarity which is the electrification polarity of normal altogether in case it passes a conductive liner sheet 62, they are certainly collected by the cleaning rotation brush 44. In addition, what is arranged to the upstream of the cleaning rotation brush 44 is not restricted to a sheet configuration, but is good also as a roller, a blade, etc.

[0063] Although the gestalt of operation of this invention was explained above Although the copying machine illustrated as a gestalt of the above-mentioned implementation is put on a middle imprint belt, and imprints the toner image formed in each photo conductor drum and the recording paper is made to imprint the toner image on a middle imprint belt further It cannot be overemphasized that this invention is applicable to the copying machine which puts the toner image formed in each photo conductor drum on a direct record object one by one, and imprints it.

[0064]

[Effect of the Invention] As mentioned above, according to the color-picture formation equipment of this invention, each image-formation unit was able to consider as a cleaner loess configuration by establishing a toner maintenance means hold temporarily the residual toner which remained on image support after the imprint, discharging the residual toner from a toner maintenance means to predetermined timing, and having made it collect in the recovery means established on the middle imprint object, maintaining high definition as explained. And the color

picture formation equipment which improvement in the speed and miniaturization of printing speed were attained, maintaining high definition, and was excellent in pair environment nature is offered by having carried out the parallel arrangement of each of these image formation units continuously, and having used the electrification means of a contact process, and the imprint means.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing having shown the whole copying machine configuration concerning the gestalt of the 1st operation.

[Drawing 2] It is drawing having shown the configuration of an image formation unit.

[Drawing 3] It is timing-chart drawing of image formation processing control.

[Drawing 4] It is drawing having shown the whole copying machine configuration concerning the gestalt of the 2nd operation.

[Drawing 5] It is drawing having shown the configuration of an image formation unit and a cleaner box.

[Drawing 6] It is drawing having shown the configuration of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 7] It is drawing having shown the 1st modification of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 8] It is drawing having shown the 2nd modification of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 9] It is the outline block diagram of conventional color picture formation equipment.

[Description of Notations]

- 1 30 Copying machine
- 2 32 Development counter
- 3 Photo Conductor Drum
- 4 Electrification Brush
- 5 Maintenance Roller
- 6 Primary Imprint Roller
- 7 Laser Arm Head
- 10 Image Formation Unit
- 11 Middle Imprint Belt
- 12 Secondary Imprint Belt
- 13 Fixing Roller
- 20 Conveyance Section
- 21 Medium Tray
- 22 Cleaning Blade
- 23, 33, 43 Cleaner box

[Translation done.]

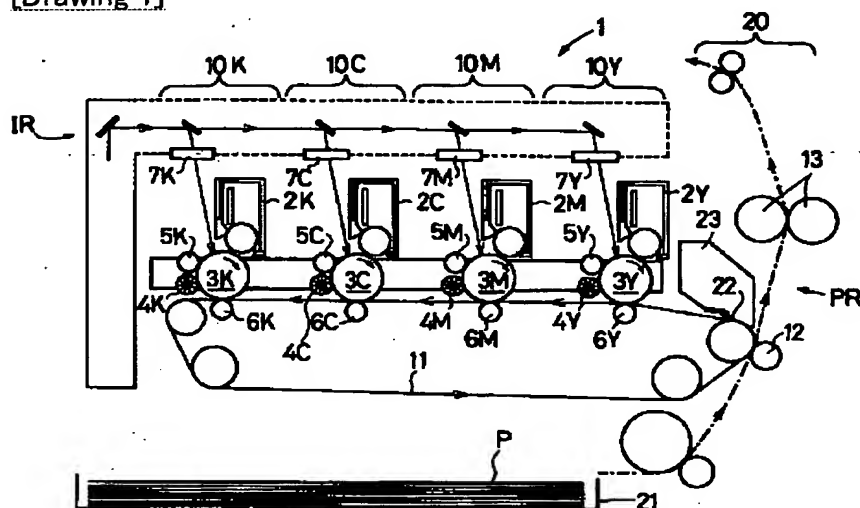
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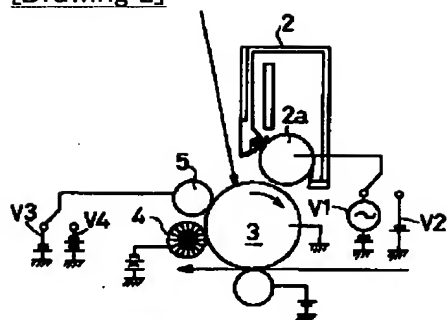
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DRAWINGS

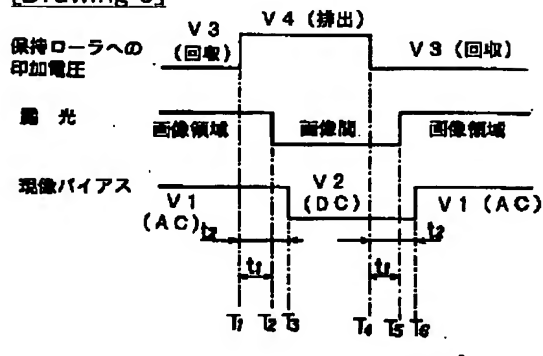
[Drawing 1]



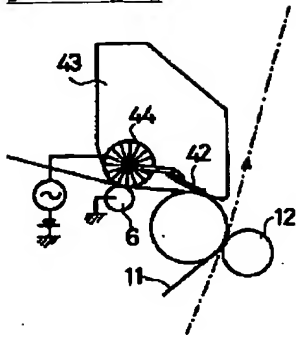
[Drawing 2]



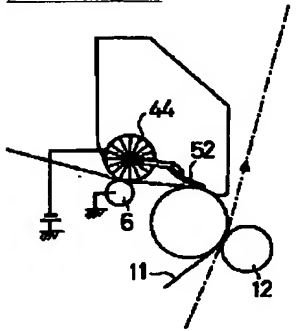
[Drawing 3]



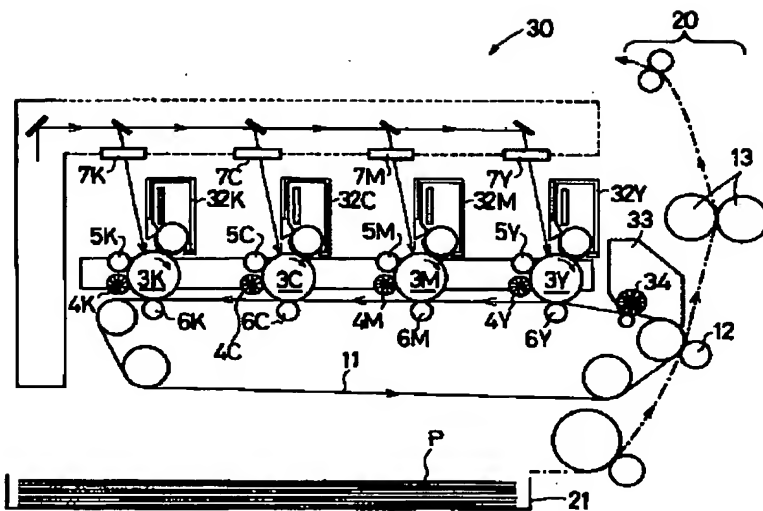
[Drawing 6]



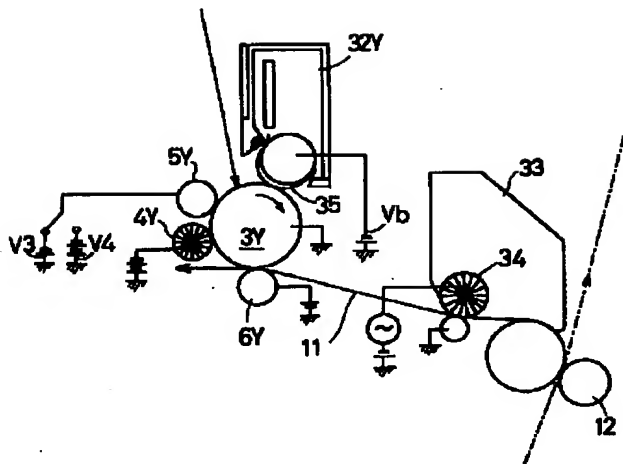
[Drawing 7]



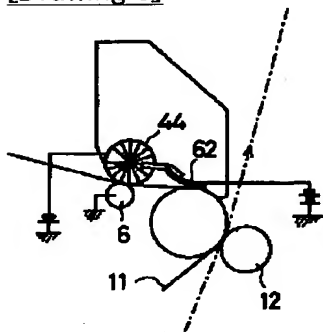
[Drawing 4]



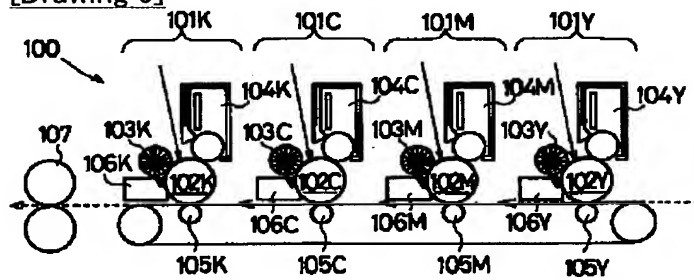
[Drawing 5]



[Drawing 8]



[Drawing 9]



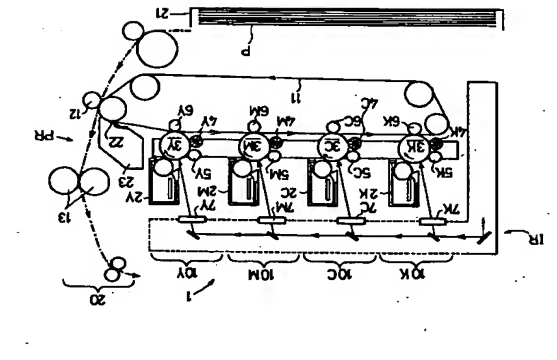
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(54) 【発明の名称】 カラー画像形成装置

(57) 【要約】
【課題】 高画質を維持しつつ印字速度の高速化およびコンパクト化を図ることができ、さらに対露光性に優れたカラー画像形成装置を提供すること。
【解決手段】 タンデム式の複写機1において、1次転写後に感光体ドラム3上に残留した残留トナーを一時的に保持する保持ローラ5を設け、所定のタイミングにて保持ローラ5からその残留トナーを排出し、中間転写ベルト11上に設けられたクリーナボックス23内に回収するようにした。これにより、メモリー画像や縮小画像のザラツキ等の画質劣化やトナーの混色を防止した上で各画像形成ユニット10をクリーナ構成とすることができ、高画質を維持しつつ印字速度の高速化およびコンパクト化が図られる。さらに、接触式の帯電ブラシ4、転写ローラ6および12を用いているのでオゾン発生による環境汚染もない。



(2) 特開平11-249452

【請求項6】 請求項4に記載するカラー画像形成装置において、
前記回収手段は、前記中間転写体に接触して設けられた清掃手段であり、
前記清掃手段は、回転清掃手段と固定清掃手段とを有することと特徴とするカラー画像形成装置。
【請求項7】 請求項5または請求項6に記載するカラー画像形成装置において、
前記清掃手段の上流側に前記トナー保持手段から排出された残留トナーを正偏の電圧に再帯電させる荷電手段を有することを特徴とするカラー画像形成装置。
【請求項8】 請求項7に記載するカラー画像形成装置において、
前記荷電手段は、帯電系列において前記トナー保持手段から排出された残留トナーに対し正側に電圧を印加して帯電させることを特徴とするカラー画像形成装置。
【請求項9】 請求項7に記載するカラー画像形成装置において、
前記荷電手段は、導電性部材で形成された正規の帯電電圧と同じ極性の電圧が印加されていることを特徴とするカラー画像形成装置。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】 本発明は、電子写真方式の複写機やプリンタ等に用いられるカラー画像形成装置に関する。さらに詳細には、画像形成ユニットをクリーナ構成とすることにより、高画質を維持しつつ印字速度の高速化およびコンパクト化が図られるとともに対露光性に優れたカラー画像形成装置に関するものである。
【0002】
【従来の技術】 従来のカラー画像形成装置の一例として、図9に示すようなものがある。この画像装置100は、イエロー、マゼンタ、シア、ブラック用の4つの画像形成ユニット101Y、101M、101C、101Kを通過して並列配置したタンデム式のものである。イエロー用の画像形成ユニット101Yは、感光体ドラム102Yを中心として、その周りに感光体ドラム102Yの表面を一周して帯電させる帯電チャージャー103Yと、感光体ドラム102Y上に形成された静電潜像を現像してトナー像とする現像器104Yと、トナー像を記録体に転写するための転写チャージャー105Yと、トナー像の転写後に感光体ドラム102Y上に残留した残留トナーを回収して収容するクリーニングボックス106Y等とを有するものである。またマゼンタ、シア、ブラック用の画像形成ユニット101M、101C、101Kもこれと同様の構成のものである。
【0003】そして、画像形成ユニット101Yによりイエロー成分の静電潜像が感光体ドラム102Y上に形成され、この静電潜像が現像器104Yにより現像されてトナー像とされた後、そのトナー像が転写チャージャー

回収されるから高面質が確保される。場合によっては、回転清掃手段と固定清掃手段とのどちらか一方のみを用いてもよい。ただし、球形トナーを使用する場合には、固定清掃手段により回収するのが困難であるから、回転清掃手段と固定清掃手段との併用が望ましい。

【0021】請求項7によれば、請求項5または請求項6に記載するカラー画像形成装置において、前記滑動手段の上流側に前記トナー保持手段から排出された残留トナーを正規の極性に再充電させる荷電手段を有すること

段は、帯電系列に対して前記ナナー保持手段から排出される残留ナナーに対し正則にある材質で形成されており、前記請求項7に記載するカラー画像形成装置において、前配ことを特徴とする。さらに、請求項9の発明によれば、請求項7に記載するカラー画像形成装置において、前記荷電手段は、導電性箔材で形成され正規の荷電極性と同一

【0022】これらのカラー画像形成装置では、トナー保持手段から排出された残留トナーが荷電手段により正規の荷電極性に帯電させられる。そして、その残留トナーの荷電極性に帯電させられる。このときの清浄掃帚手段により回収される。

に弊留トナーを回収することができるため、高画質が確保される。なお、荷電手段としては、荷電系列においては、あるいは帯電部材を用いてそれに正規の帯電極性と同じ極性の電圧を印加する等が挙げられる。

【0023】
【発明の実施の形態】以下、本発明のカラー画像形成装置を具体化する本実施の形態について図面に基づいて詳細に説明する。本実施の形態は、本発明のカラー画像形成装置に適用したデジタルカラー複写機（以下、単に「複写機」という。）である。

【００２４】まず、第１に実物の形態について説明する。第１の実物の形態にかかわる変換１は、図１に示すように、大きく分けて原画像を透過紙にイメージリテータ部ＩＲと、読み取った原画像を透過紙にプリントして再現するプリント部ＰＲとから構成されている。イメージリテータ部ＩＲは、原画像を赤（Ｒ）、緑（Ｇ）、青（Ｂ）の３原色に色分解して得た赤光情報とＣＣＤセンサで読み取り、その画像データ部Ｐに対して演算処理を行うものである。また、プリント部Ｐは、透過紙Ｐを搬送する搬送部２０と、透過紙Ｐに再現色であるイエロー（Ｙ）、マゼンタ（Ｍ）、シアン（Ｃ）、ブラック（Ｋ）（以下、イエロー、マゼンタ、シアン、ブラックの各再現色に關する部分の番号は、各符号「Ｙ、Ｍ、

C、K」を適宜付加する。)の4色の画像をそれぞれ形成するための4つの画像形成ユニット10Y、10M、10C、10Kおよび中間転写ベルト11とを備えてな

光される。一方、感光度ドラム3Y、3M、3C、3K光される。図4の矢印方向に順次しており、帯電ブラシ4Y、4M、4C、4Kにより表面を一様に帯電される。その後、抑電リザーブ光により露光が定される。3Y、3M、3C、3Kに形成される感光度ドラム3Y、3M、3C、3Kによりそれぞれ各色の露光に対応する帯電電荷像は、各帯電色のトナナ像として内蔵現像器2Y、2M、2C、2Kによりそれぞれ現像されて各色のトナナ像とされる。そしてこれら

のトナー像は、感光体ドラム3、3M、3C、3Kと中間転写ベルト1との各対向面において、1次転写ローラ6Y、6M、6C、6Kにより、中間転写ベルト11上に順次重ね転写される。その後、中間転写ベルト11上に形成されたトナー像は、2次転写ローラ12ととの対向面へと搬送される。そして、給紙トレイ21から給紙された記録紙Pに中間転写ベルト11のトナー像が2次転写ローラ12により2次転写される。その後、トナー像が転写された記録紙Pは、定着ローラ13に搬送されて、ここで加熱されて各色のトナー像が溶着してフルカラー画像とされとともに、記録紙11上にて定着される。

【0030】一方、中間転写部11への1枚転写後に感光体ドラム3Y、3M、3C、3Kに残留した残留トナーは保持ローラ5Y、5M、5C、5Kに、また保持ローラ5Y、5M、5C、5Kから排出された残留トナーおよび配紙紙Pへの2枚転写後に中間転写部11上に残留したトナーは、クリーナボックス23に回収される。

【0031】ここで、クリーナレス化された画像形成ユニットにおける感光体ドラム上の残留トナーの処理について、図2を用いてより詳細に説明する。なお、各画像形成ユニットはすべて同じ構成であるから、色符号を省略して説明する。

【0032】まず、帯電ブラシ4に-1200Vを印加して感光体ドラム3の表面を約-700Vに帯電させる。この際、1次転写後に感光体ドラム3上に残留したため、保持残留トナーも同時に負値性に帯電させられるため、保持

ローラ 5 に -300 V 程度の電圧を印加することにより、裏層トナー 2 の電位はほぼすべて保持ローラ 5 に回収される。トナーが一切存在しない感光体ドラム 3 上の露光位置に、トナーが一切存在しないの感光体ドラム 3 上の露光位置と等しい感光度で露光された静電潜像のザラツキや歪の質劣化は発生しない。このようにして形成された静電潜像は、現像器によって現像が行われる。すなわち、現像エッジは、現像器によってより広く 200 μm に設定された現象ベアアップが印加されている。また、直流電流 -300 V に振幅 1600 V、周波数 82 Hz の交流成分を加えた現象ベアアップが印加され、これにより現象ローラ 2 a に形成されたトナー層は現象領域で飛翔して静電潜像に付与され、感光体ドラム 3 上に形成された静電潜像が現象されてトナー像が形成される。

【0033】このときの感光体ドラム3上での現像に供

[illegible]

[0034] ここでA3サイズで通紙方向の印字長さを4.4 cmとして、全面ベタ画像を転写した場合は考慮する。なお本実施形態での転写効率 は90%である。前記転写したように現像されるトナーの量は 0.9 mg/cm^2 、転写効率が90%であるから、実際に現像に使用されるトナーの量は 3.24 mg/cm^2 となる。従っ

6 mg/cm² となる。そして、本装置の形態では保持ローラー5の外径をΦ16 mmとしているから、保持ローラー5が回収すべきトナー量は0.72 mg/cm² となり、また残留トナーの層は2層以下であることから保持ローラー5によって十分担持することができる。

【0035】そして、保持ローラ5に回収した残留トナーを非画像形成時に排出し処理する必要があるが、回収した残留トナーは、1次転写ローラ6による転写でトナー像を重ね合わす際、他の色成分のトナー像と接触する

のため若干なりとも屈色による。このため、モノクロームのクリエーション・イメージ形成装置として、現像器2層までが採用できない。そこで、保持ローラ5から排出された残留成分をオパール直流成分のみで切り替えるという現象パイア成分を制御を行うこととしている。これにより、保持ローラ5から排出された残留成分が、現像器2に回収されることとなり、現像位置を通過することとなりトナーの屈色が防止される。

【0036】このときの現象ベイス制御について図3のタイミングチャートを用いて説明する。時刻T₁以前においては、画像処理回路の状態にありレーザヘッド72による露光走査が行われ、露光画像が形成されて、現象係数ベイス22によって現象ベイスが行われ、現象係数ベイス1が印加され現象係数ベイス2が行われていた。また、保持電源5には電圧V3が印加され、1次磁芯後の真鍮コ어가回収されている。

【0037】そして時刻 T_1 において、保持ローラ5への印加電圧が電圧V4に切り替えられ、残留トナーの排出が開始される。また、時刻 T_1 から時間 t_1 （経過後の時刻 T_2 ）においては、レーザヘッド7による露光走査が終了する。ここで、時間 t_1 は、感光体ドラム3上の仕

意の位置が保持ローラ5との対向位置から露光位置まで移動するのに要する時間である。すなわち、時刻 T_2 において、保持ローラ5から感光体ドラム3上に排出された残留トナーが、露光位置に到達する直前にレーザヘッド7による露光走査が終了するのである。これにより、レーザヘッド7による露光走査時に、感光体ドラム3上の露光位置に保持ローラ5から排出された残留トナーが存在することはなく、メモリ画像や网点画像のサラッキ等の面質劣化が防止される。

[0038] さらに、時刻 T_1 から時間 t_2 経過後の時刻 T_3 においては、現像バイアスが交流電圧 $V1$ から直流電圧 $V2$ に切り替えられる。ここで、時間 t_2 は、感光体ドラム3上の任意の位置が保持ローラ5との対向位置から現像位置まで移動するのに要する時間である。すなわち、時刻 T_3 において、保持ローラ5から感光体ドラム3上に排出された残留トナーが、現像位置に到達する直前に現像バイアスが交流電圧 $V1$ から直流電圧 $V2$ に切り替わるのである。これにより、保持ローラ5から排出された残留トナーが、現像器2に回収されることなく現像位置を確実に通過するので、トナーの脱色が防止される。

[0039] このようにして現像位置を通り過ぎた保持ローラ5から排出された残留トナーは負電性で帯電している。その一方、1次転写ローラ6には $-500V$ が印加されているから、残留トナーは中間転写ベルト11に転写され、その後クリーニングブラシ222により除去され、クリーニングボックス23内に収容される。

[0040] その後、時刻 T_4 において、保持ローラ5に印加される電圧が再び電圧 $V3$ に切り替わり、残留トナーの排出を終了し回収を開始する。また、時刻 T_4 から時間 t_1 経過後の時刻 T_5 において、レーザヘッド7による露光走査が行われる。さらに時刻 T_5 から時間 t_2 経過後の時刻 T_6 において、現像バイアスが交流電圧 $V2$ から交流電圧 $V1$ に切り替えられて、画像形成処理が再び行われる。そして上記の残留トナー処理が繰り返行行われ、残留トナーが適切に処理される。これにより、各画像形成ユニットごとに残留トナーを回収するためのクリーニングボックスを設ける必要がなくなるから、クリーナリゼ化を達成できるのである。

[0041] 以上、詳細に説明したように本実施の形態に係る複写機1によれば、1次転写後に感光体ドラム3上に残留した残留トナーを一時的に保持する保持ローラ5を設け、所定のタイミングにて保持ローラ5からその残留トナーを排出し、中間転写ベルト11上に設けられたクリーナボックス23内に回収するようにしたことにより、高面質を維持しつつ各画像形成ユニット10をクリーナリゼ構成とすることができ占有容積が小さくなるから、装置のコンパクト化が図られている。また、複写機1はタンデム式であるから、印字速度の高速化も図られている。さらに、接触式の帯電ブラシ4、転写ローラ

供されるトナー量は $0.9\text{mg}/\text{cm}^2$ 程度で十分な濃度を確保できる。また、中間転写ベルト11に対して適切な帯電電圧を印加することにより高転写効率を得ることができ、従って、本実施の形態では1次転写ローラ6 Yに転写電圧として $-500V$ を印加した。そして高転写効率を確保することにより、1次転写後の感光体ドラム3 Y上に残留する残留トナーの量を少なくすることが可能になる。

[0047] ところが、現像器32 Yにおいては現像スリーブ35が感光体ドラム3 Yと接触しているから、保持ローラ5 Yから排出された残留トナーが現像器3 Yに回収されてしまう。このため、一番最初に中間転写ベルト11に1次転写を行うイエローの画像形成ユニットにおいては脱色の問題は生じないが、イエロー(Y)の次に配置されているマゼンタ(M)、シアン(C)、ブラック(K)の各画像形成ユニットでは他色との脱色が問題となる。

[0048] そこで本実施の形態においては、球形トナーを用いることにより、転写効率をほぼ100%とし、1次転写後に感光体ドラム3 Y上にトナーがほとんど残留しないようにしている。このため、残留トナーを保持ローラ5 Yにて回収して現像器3 Yのライフサイクルまで保持することが可能となる。そして、保持ローラ5 Yに回収された残留トナーは、現像器2 Yの交換時に保持ローラ5から排出され、中間転写ベルト11を介して回転ブラシ34を備えるクリーニングボックス33に回収される。球形トナーを使用しているため、プレードで中間転写ベルト11上の残留トナーを除去するのが困難だからである。また、除去効率を高めるために、回転ブラシに交流成分が $-500V$ の電圧に、交流成分として振幅 $100V$ 、周波数 2kHz を重畳した電圧を印加している。これにより、中間転写ベルト11上の残留トナーが確実に除去され、クリーニングボックス33内に収容される。

[0049] 前記したように本実施の形態ではトナーの球形化が必要であるため、トナー形状による面質劣化について調べた。その結果を表1に示す。

[0050]

[表1]

形状指数SF	面質品質
0.94	x
0.95	x~Δ
0.96	○
0.985	○
0.995	○

[0051] 表1から明らかなように、形状指数SFが小さくなるにしたがって、面質劣化が顕著になる。そして、形状指数SFが 0.96 以上であれば面質劣化が生じずに高面質を確保できる。従って、球形トナーとして使用できるのは、形状指数SFが 0.96 以上 1.0 の条件を満たすトナーであり、より好ましくは形状指数SFが限りなく 1.0 に近い方がよい。

[0052] 以上、詳細に説明したように第2の実施の形態に係る複写機30によれば、接触現象方式の現像器2に球形トナーを収容したことにより、ほぼ100%の転写効率を得られる。これにより、1次転写後に感光体ドラム3上に残留する残留トナーは微量となるから、この残留トナーを保持ローラ5にて回収して現像器3のライフサイクルまで保持することが可能となり、トナーの脱色も防止される。従って、高面質を維持しつつ高画像形成ユニットをクリーナリゼ構成とすることができ占有容積が小さくなるから、装置のコンパクト化が図れる。また、複写機1はタンデム式であるから、印字速度の高速化も図られている。さらに、接触式の帯電ローラシ4、転写ローラ6および12を用いているのでオゾン発生による環境汚染もない。

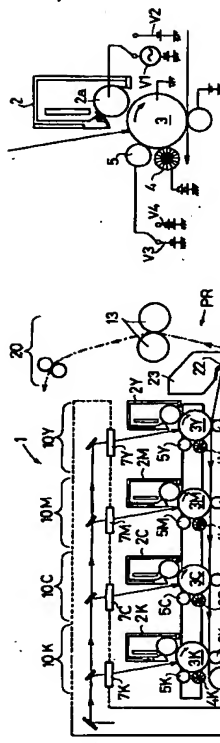
[0053] なお、本実施の形態は単なる例示にすぎず、本発明を何ら限定するものではない。従って本発明は当然に、その要旨を逸脱しない範囲内で種々の改良、変形が可能である。例えば上記第2の実施の形態では、帯電ブラシ4と保持ローラ5との配置位置を逆にしてもよい。中間転写ベルト11を介しているため1次転写電圧を低く抑えられるから、感光体ドラム3 Y上の残留トナーの帯電電性が逆電性になる可能性が少ないため、保持ローラ5の回収能力が低下するおそれほとんどないからである。また、残留トナーの保持手段として保持ローラ5を使用しているが、保持ローラ5を設けずに帯電ブラシ4に交流電圧を印加することにより、感光体ドラム3の帯電と残留トナーの回収を兼用させることも可能である。なお、各画像形成ユニットの配置順序や印加電圧等は単なる例示であり、これに限られないことは言うまでもない。

[0054] 最後に、第3の実施の形態について説明する。第3の実施の形態に係る複写機は、第2の実施の形態に係る複写機1と基本的構造を同じくし、クリーニングボックスの構成のみが異なる。すなわち図6に示すように、クリーニングボックス43は、クリーニング回転ブラシ44とクリーニングブレード42とを備える。

[0055] この複写機でも第2の実施の形態と同様に、感光体ドラム3上に形成されたトナー像は、感光体ドラム3と中間転写ベルト11との各対向部において、1次転写ローラ6により、中間転写ベルト11上に順次重ね転写される。その後、中間転写ベルト11に重ね転写されたトナー像は、2次転写ローラ12との対向部へと搬送される。そして、給紙トレイ21から給紙

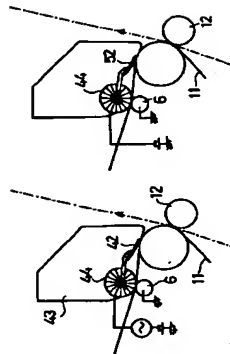
- る。
【図1】第1の実施の形態に係る複写機の全体構成を示した図である。
【図2】画像形成ユニットの構成を示した図である。
【図3】画像形成処理制御のタイミングチャート図である。
【図4】第2の実施の形態に係る複写機の全体構成を示した図である。
【図5】画像形成ユニットおよびクリーナボックスの構成を示した図である。
【図6】第3の実施の形態に係る複写機におけるクリーナボックスの構成を示した図である。
【図7】第3の実施の形態に係る複写機におけるクリーナボックスの第1の変形例を示した図である。
【図8】第3の実施の形態に係る複写機におけるクリーナボックスの第2の変形例を示した図である。
【図9】従来のカラー画像形成装置の概略構成図である。

【図1】

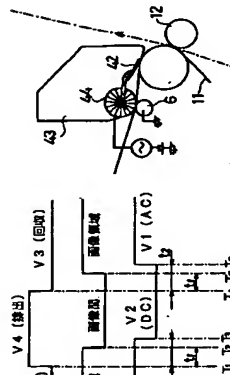


【図2】

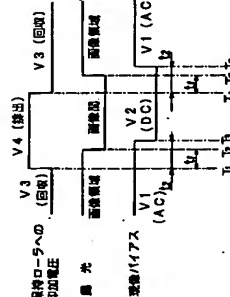
【図7】



【図6】



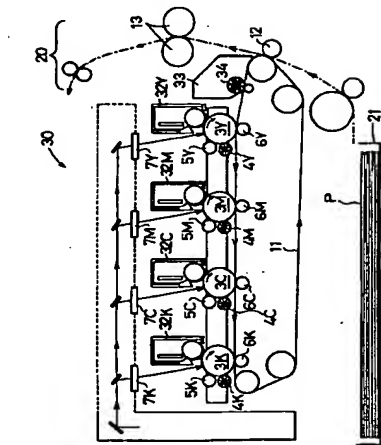
【図3】



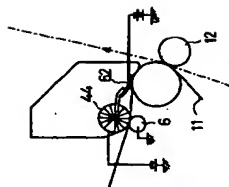
- した形態ではクリーニング回転ブラシ44に対して交流成分を重畳した電圧を印加しているが、交流成分を重畳しなくとも、以下に示す構成とすることにより同様の除去効果を得ることができる。
【0061】すなわち、第1の構成は図7に示すように、クリーニング回転ブラシ44の上流側に2次転写後に中間転写ベルト11上に残留したトナーの帯電性を、正極の極性（本実施の形態においては負極性となる）に帯電させるナイロンシート52を設けている。また、クリーニング回転ブラシ44には、直流電圧+500Vが印加されている。従って、2次転写後に中間転写ベルト11上に残留したトナーは、ナイロンシート52を通過する際に、すべて正極の帯電極性である負極性に帯電せられるから、確実にクリーニング回転ブラシ44に回収される。なお、クリーニング回転ブラシ44の上流側に配置するものはナイロンシートに限らず、シリコンゴム等のようにトナーを正極の極性に帯電させるものであればよく、シートに限らずローラやブレード等で構成することも可能である。
【0062】また、第2の構成は図8に示すように、クリーニング回転ブラシ44の上流側に導電性シート62を設けている。そして、導電性シート62には直流電圧-1000Vを、クリーニング回転ブラシ44には直流電圧+500Vを印加している。従って、2次転写後に中間転写ベルト11上に残留したトナーは、導電性シート62を通過する際に、すべて正極の帯電極性である負極性に帯電せられるから、確実にクリーニング回転ブラシ44に回収される。なお、クリーニング回転ブラシ44の上流側に配置するものはシート形状に限らずローラやブレード等としてもよい。
【0063】以上本発明の実施の形態について説明したが、上記実施の形態として例示した複写機は、各感光体ドラムに形成されたトナー像を中間転写ベルトに重ね転写し、さらに中間転写ベルト上のトナー像を記録紙に転写させるものであるが、本発明は各感光体ドラムに形成されたトナー像を直接記録紙に順次重ね転写する複写機等にも適用できることには言うまでもない。
【0064】
【発明の効果】以上、説明した通り本発明のカラー画像形成装置によれば、転写後に像担持体上に残留した残留トナーを一時的に保持するトナー保持手段を設け、所定のタイミングにてトナー保持手段からその残留トナーを排出し、中間転写体上に設けられた回収手段内に回収するようにしたことにより、高画質を維持しつつ各画像形成ユニットをクリーナレス構成とすることができた。そして、これらの各画像形成ユニットを連続的に並列配置し、接触性の帯電手段、転写手段を用いたことにより、高画質を維持しつつ印字速度の高速化およびコンパクト化が図られ、かつ対環境性に優れたカラー画像形成装置が提供されている。

- された記録紙Pに中間転写ベルト11上のトナー像が2次転写ローラ12により2次転写される。その後、トナー像が転写された記録紙Pは、定着ローラ13に搬送されて、ここに加熱されて各色のトナー像が密着してフルカラー画像にされるとともに、記録紙P上に定着される。
【0056】一方、中間転写ベルト11への1次転写後に感光体ドラム3上に残留した残留トナーは保持ローラ5に、また保持ローラ5から排出された残留トナーおよび記録紙Pへの2次転写後に中間転写ベルト11上に残留したトナーは、クリーニング回転ブラシ43に回収される。
【0057】ここで、中間転写ベルト11上に重ね転写されたトナー像を記録紙P上に2次転写する際の転写効率が著しく低くなる、回転清掃手段あるいは固定清掃手段のみだけでは十分にクリーニングすることができず、に、画質劣化を引き起こす原因となってしまう。例えば、2次転写ローラ12や中間転写ベルト11の抵抗変化が大きい場合、記録紙が非常に粗い場合等に2次転写効率が低下する。そこで本実施の形態に係る複写機では、クリーニング回転ブラシ44とクリーニングブレード42とを備えるクリーニングボックス43を設けている。
【0058】そして、中間転写ベルト11上に残留したトナーは、まずクリーニングブレード42によりその大半が機械的に除去され回収される。また、紙粉や異物等もクリーニングブレード42により除去される。この際クリーニングブレード42で除去しきれなかったトナーは、直流成分が-500Vの電圧に、交流成分として振幅100V、周波数2kHzを重畳した電圧が印加されているクリーニング回転ブラシ44により機械的および電気的に除去され回収される。これにより、中間転写ベルト11上に残留したトナーは確実に除去され、クリーニングボックス43内に回収される。従って、2次転写効率が低下して中間転写ベルト11上に多くのトナーが残留した場合でも、そのトナーは確実に除去され画質劣化が防止される。
【0059】以上、詳細に説明したように第3の実施の形態に係る複写機によれば、2次転写後に中間転写ベルト11上に残留したトナーは確実に除去され回収される。これにより、画質劣化が防止され高画質が維持される。また、各画像形成ユニットはクリーナレス構成で並列配置（タンデム式）されているから、コンパクトおよび印字速度の高速化が図られている。さらに、接触式の帯電ブラシ4、転写ローラ6および12を用いているのでオゾン発生による環境汚染もない。
【0060】なお、本実施の形態は単なる例示にすぎず、本発明を何ら限定するものではない。従って本発明は、当然に、その要旨を逸脱しない範囲内で種々の改良、変形が可能である。例えば、中間転写ベルト11に残留したトナーは両極性の帯電性を有しているから、本実

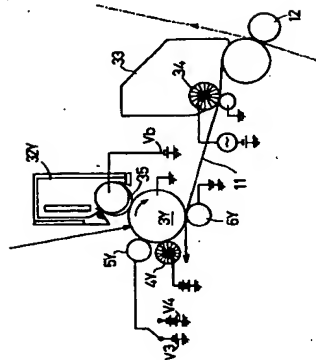
【図4】



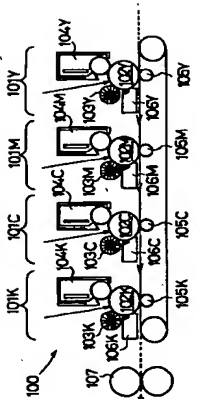
【図8】



【図5】



【図9】



【公報通知】特許法第17条の2の規定による補正の掲載
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【発行日】平成15年6月13日(2003.6.13)

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【手続補正書】
【発出日】平成15年2月24日(2003.2.2)
4)
【手続補正1】
【補正対象書類名】明細書
【補正対象項目名】請求項1
【補正方法】変更
【補正内容】
【請求項1】像担持体と、前記像担持体上に静電増像を形成する静電増像形成手段と、前記静電増像にトナーを付与してトナー像を形成する現像手段とを有し、連続的に並置された複数の画像形成ユニットと、前記画像形成ユニットごと形成されたトナー像が順次重ねね転写される中間転写体と、前記画像形成ユニットと、前記中間転写体に重ねね転写されたトナー像を配設体に転写する転写手段とを有するカラー画像形成装置において、前記画像形成ユニットの少なくとも1つは、交流バイアスを印加する非接触増像方式の現像手段を備えるクリーナーレス画像形成ユニットであり、前記中間転写体への転写後に前記像担持体上に残留した残像トナーを一時的に保持するトナー保持手段を有し、前記トナー保持手段は、所定のタイミングにて保持している残像トナーを排出することを特徴とするカラー画像形成装置。
【手続補正2】
【補正対象書類名】明細書
【補正対象項目名】0008
【補正方法】変更
【補正内容】
【0008】
【課題を解決するための手段】上記問題を解決するために請求項1の発明によれば、像担持体と、前記像担持

が図られている。なお、交流バイアスを印加する非接触増像方法とは、直流電圧に交番電圧を重ねた交流バイアスを印加することによりトナーを飛翔させて現像する非接触増像方法である。

【手続補正4】
【補正対象書類名】明細書
【補正対象項目名】0042
【補正方法】変更
【補正内容】
【0042】なお、本実施の形態は単なる例示にすぎず、本発明を何ら限定するものではない。従って本発明は当然に、その要旨を逸脱しない範囲内で種々の改良、変形が可能である。例えば上記第1の実施の形態では、現像器2Y、2M、2C、2Kとして交流バイアスを印

加する非接触増像方式のものを使用しているが、一番最初に中間転写ベルト11に対して1次転写が行われるイエロー成分については他の色成分と混色することはないので、接触増像方式とすることも可能である。また、保持ローラ5は帯電ブラシ4に対して上流側、下流側のどちら側に配置しても良く、さらに帯電ブラシ4と接触しているも一体化されていてもよい。さらにまた、帯電ブラシ4の代わりに、フィルム、ブレード、ローラ等を、保持ローラ5の代わりに、ファイバーブラシ、磁気ブラシ、フィルム、ブレード等を用いることも可能である。なお、各画像形成ユニットの配置順序や印加電圧値等は単なる例示であり、これに限られないことは言うまでもない。